

Batteries Without Metallic Contact 301

1010. To these cases must be added the many in which one metal in a uniform acid gave currents when one side was heated (930, etc.). Also those in which one metal with an acid strong and diluted gave a current (965, etc.). ion. In the cases where by dilution of the acid one metal can be made either positive or negative to another (984, etc.), one half of the results should be added to the above, except that they are too strong; for instead of proving that chemical action can produce a current without contact, they go to the extent of showing a total disregard of it, and production of the current against the force of contact, as easily as with it.

1012. That it is easy to construct batteries without metallic contact was shown by Sir Humphry Davy in 1801, when he described various effective arrangements including only one metal. At a later period Zamboni constructed a pile in which but one metal and one fluid was used,² the only difference being extent of contact at the two surfaces. The following forms, which are dependent upon the mere effect of dilution, may be added to these.

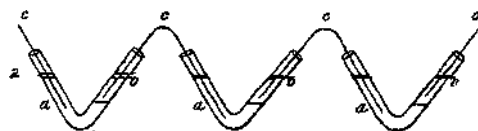


Fig. 75.

1013. Let $a\ b$, $a\ b$, $a\ b$, fig. 75, represent tubes or other vessels, the parts at a containing strong nitric or sulphuric acid, and the parts at b dilute acid of the same kind; then connect these by wires, rods, or plates of one metal only, being copper, iron, silver, tin, lead, or any of those metals which become positive and negative by difference of dilution in the acid (967, etc.). Such an arrangement will give an effective battery.

1014. If the acid used be the sulphuric, and the metal employed be iron, the current produced will be in one direction, thus $< . -$, through the part figured; but if the metal be tin, the resulting current will be in the contrary direction, thus $- >$

¹ *Philosophical Transactions*, 1801, p. 397. Also *Journals of the Royal Institution*, 1802, p. 51; and *Nicholson's Journal*, 8vo, 1802, vol. 1, p. 144.
² *Quarterly Journal of Science*, viii. 177; or *Annales de Chimie*, 1819,

